Ambitious amphidromy: using otolith microchemistry to determine the natal source of whitebait

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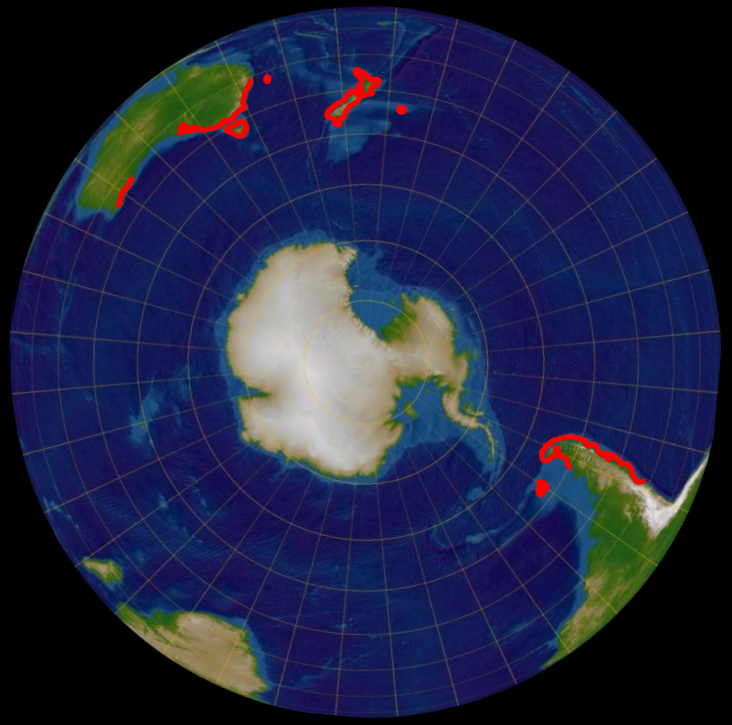
Galaxias maculatus (inanga)



- Osmeriformes > Galaxiidae > *Galaxias* (34 spp)
- Widely distributed throughout Southern Hemisphere
- Max length 190mm
- Most mature, spawn and die after 1 year

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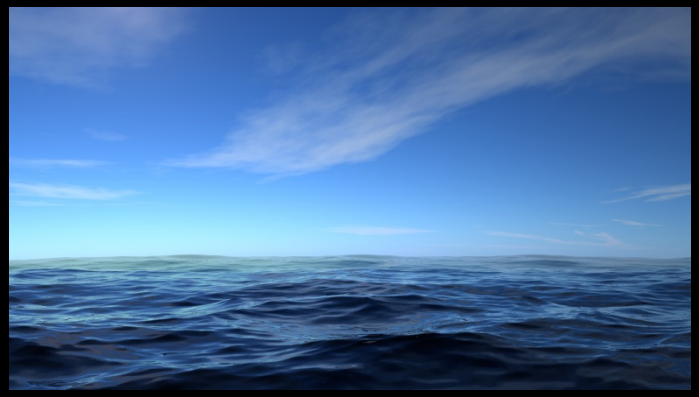
Inanga: amphidromous

Adults - lowland streams

Spawning - estuarine vegetation



Larvae - marine

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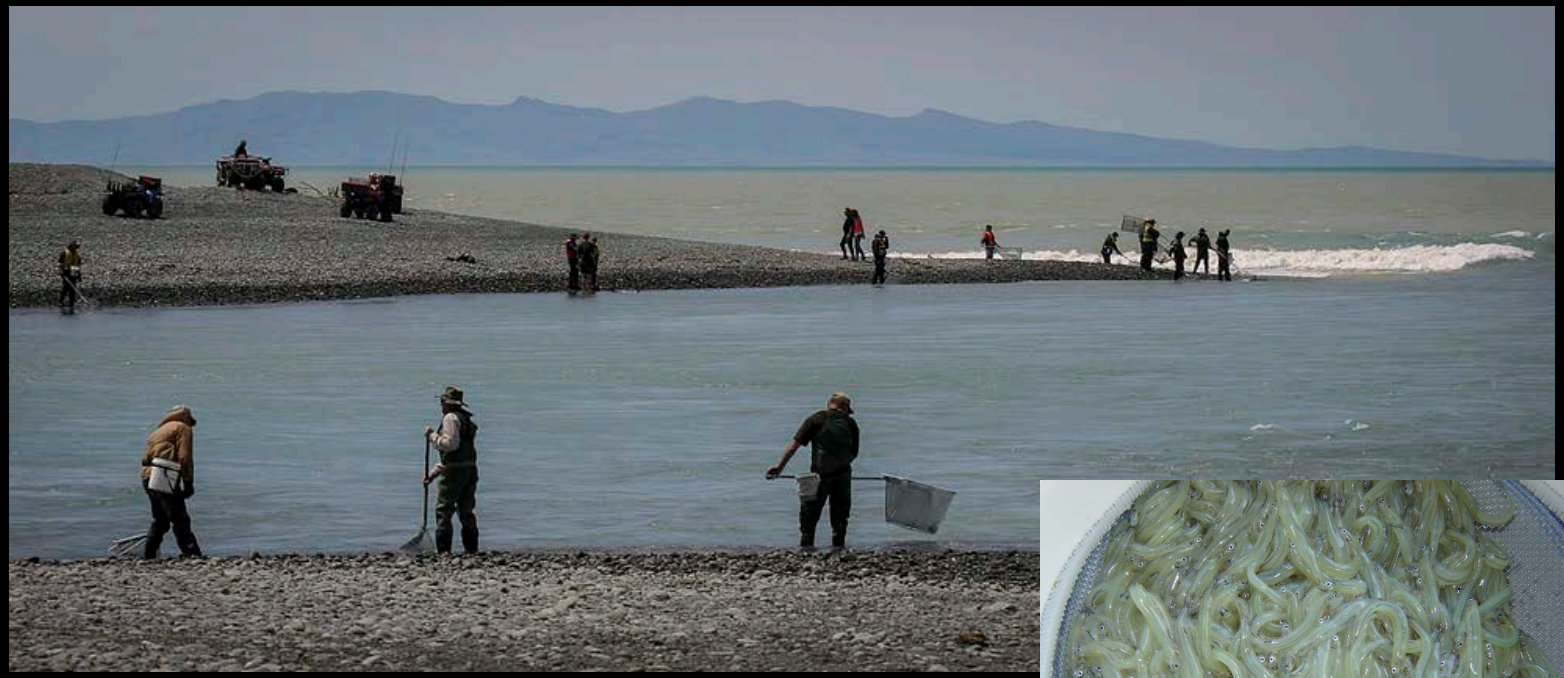
Whitebaiting



- Important commercial and recreational fishery based on post-larval recruits

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Why do we need to know the source of inanga?

- Threat classification: “At risk – declining”
- Degradation of adult and spawning habitats has formed sink populations
- Where are the source populations?
- Targeted restoration and protection

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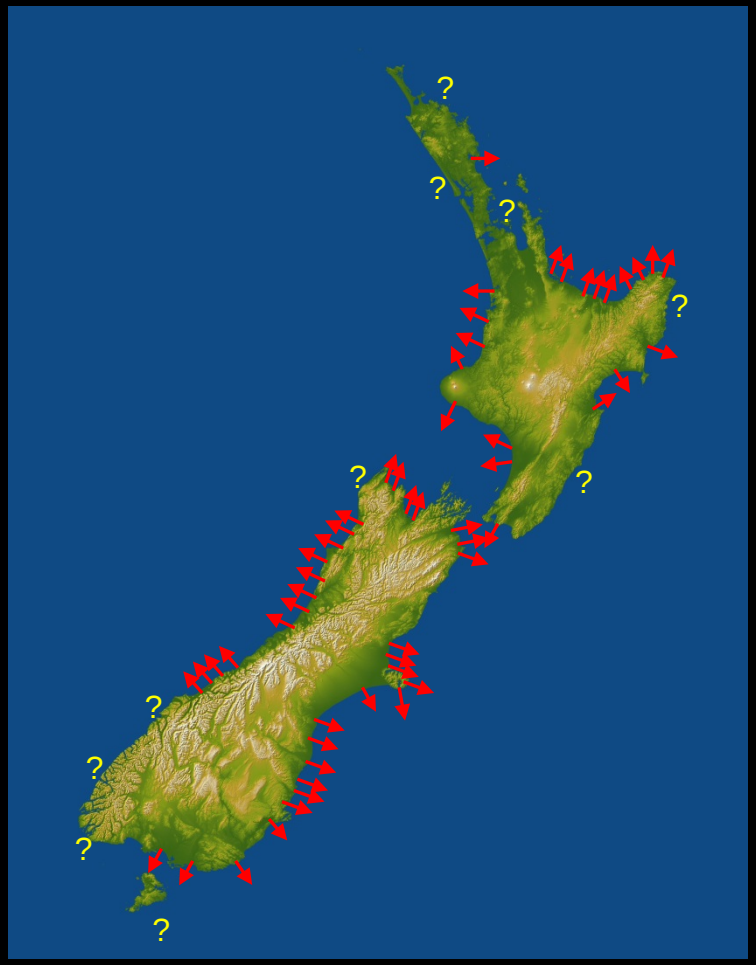
Widespread production of inanga larvae



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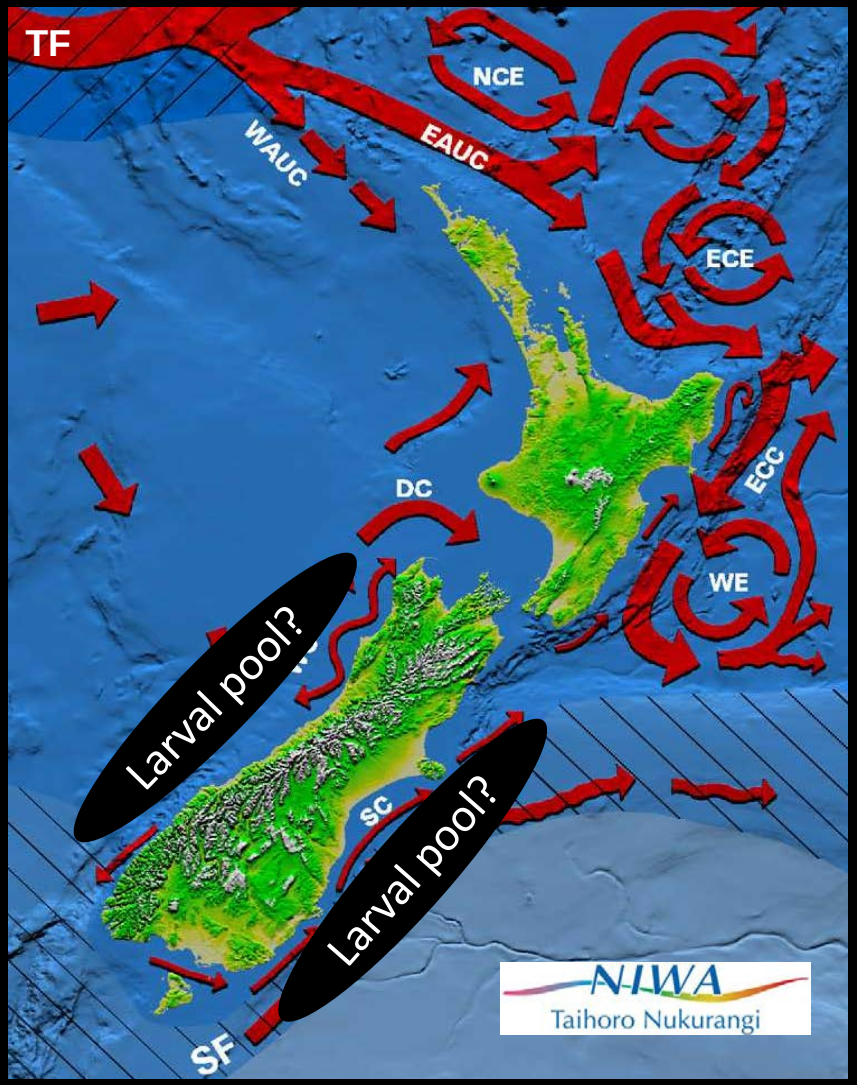
6 month planktonic phase



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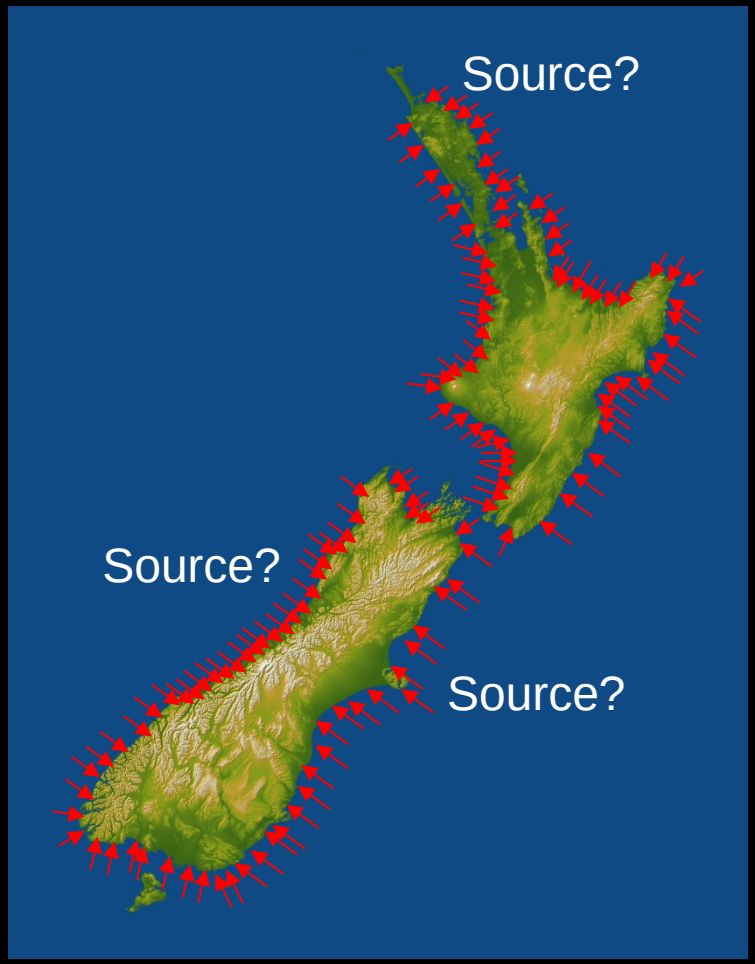
Widespread recruitment of whitebait



Genetics = complicated

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Otolith microchemistry

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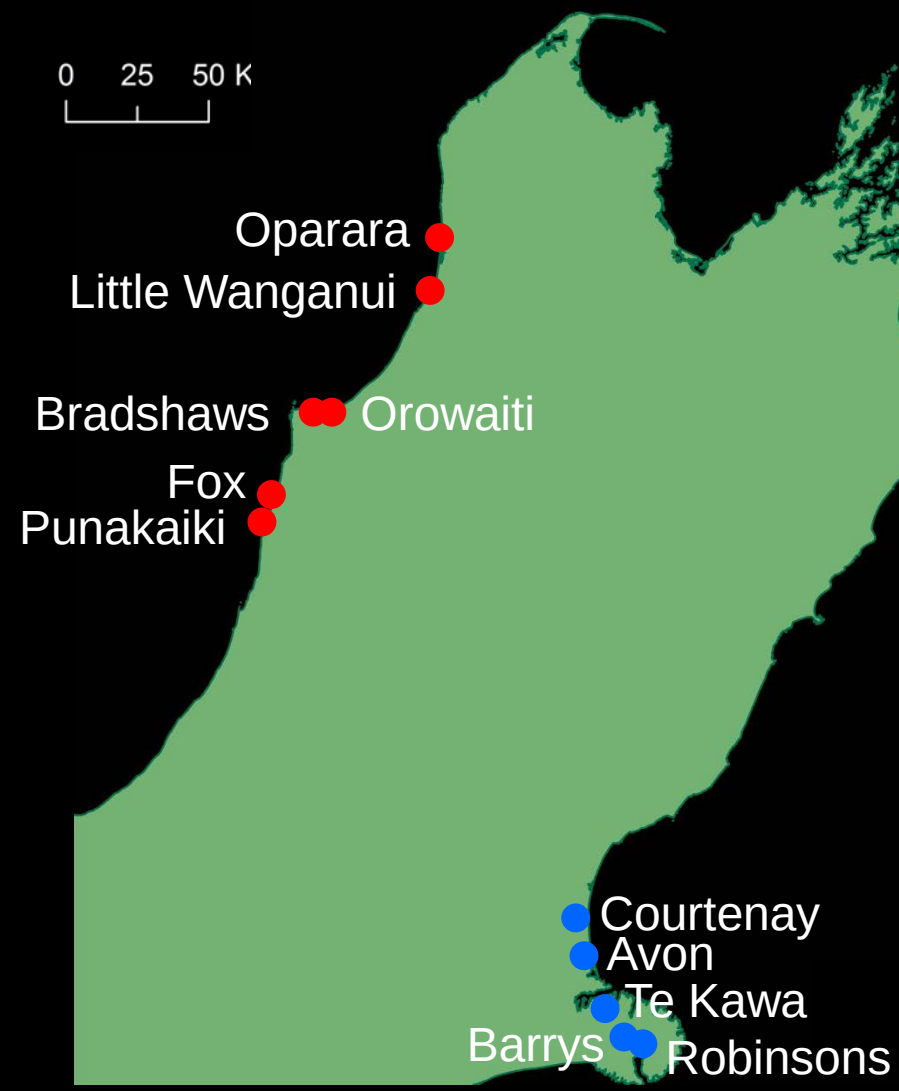
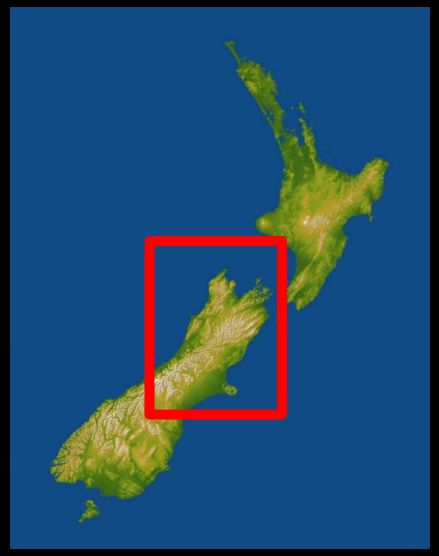
Egg collections (May & June 2009)





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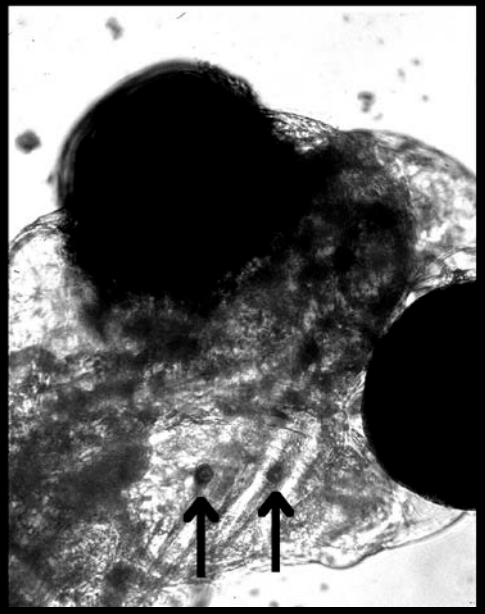
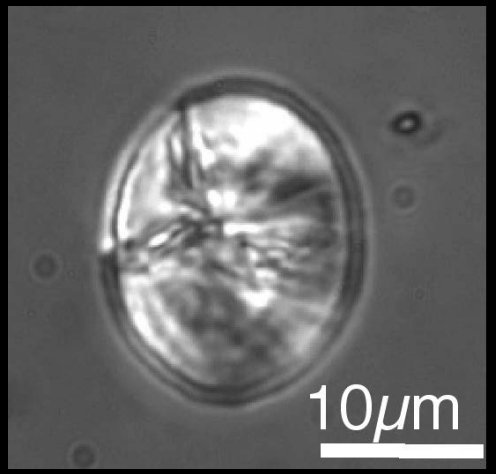
Otoliths removed from hatchlings





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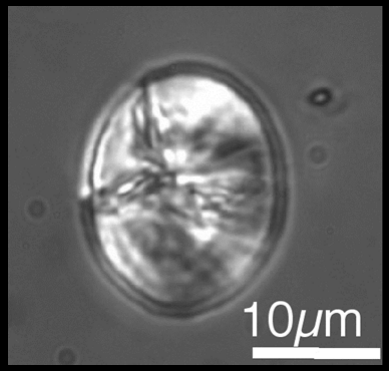
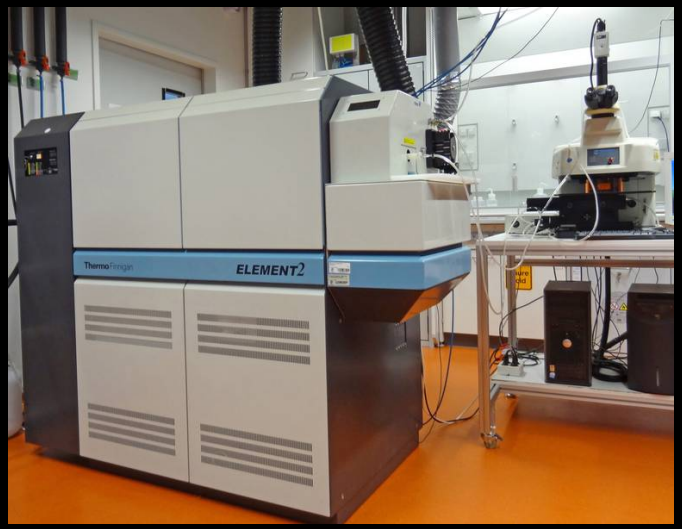
Otolith images: Barbee & Swearer (2007). *MEPS* Vol 343

Elemental concentrations in whole otolith



Laser Ablation Inductively Coupled Plasma - Mass Spectrometry



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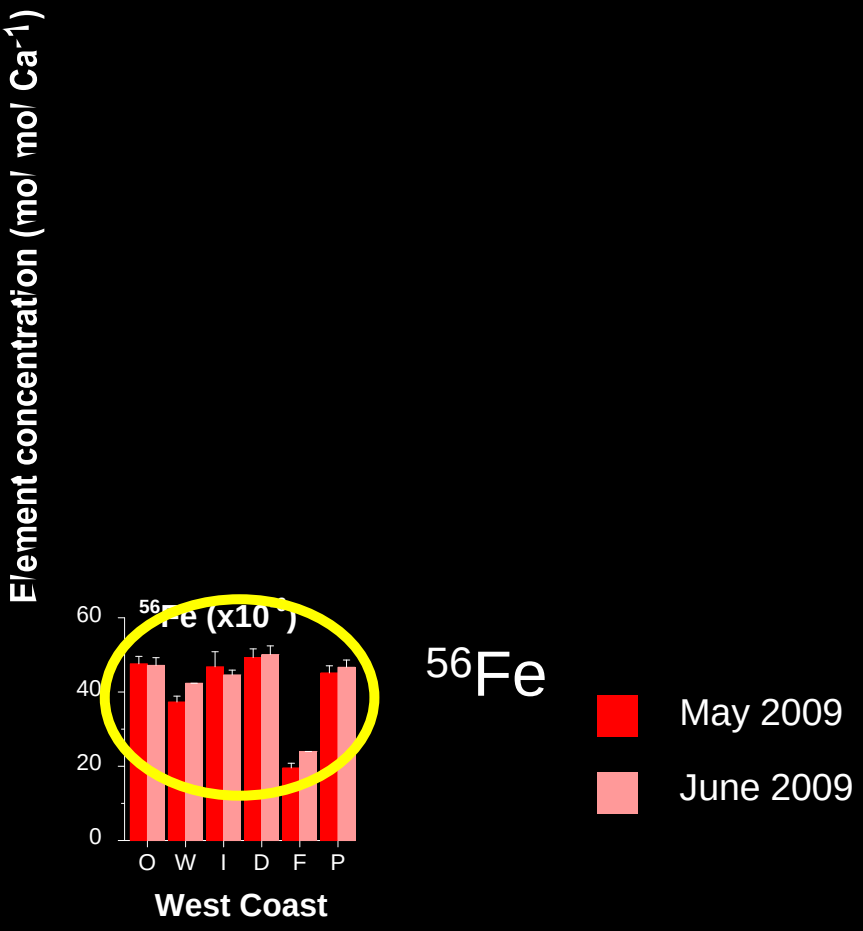
Hatchling single element concentrations



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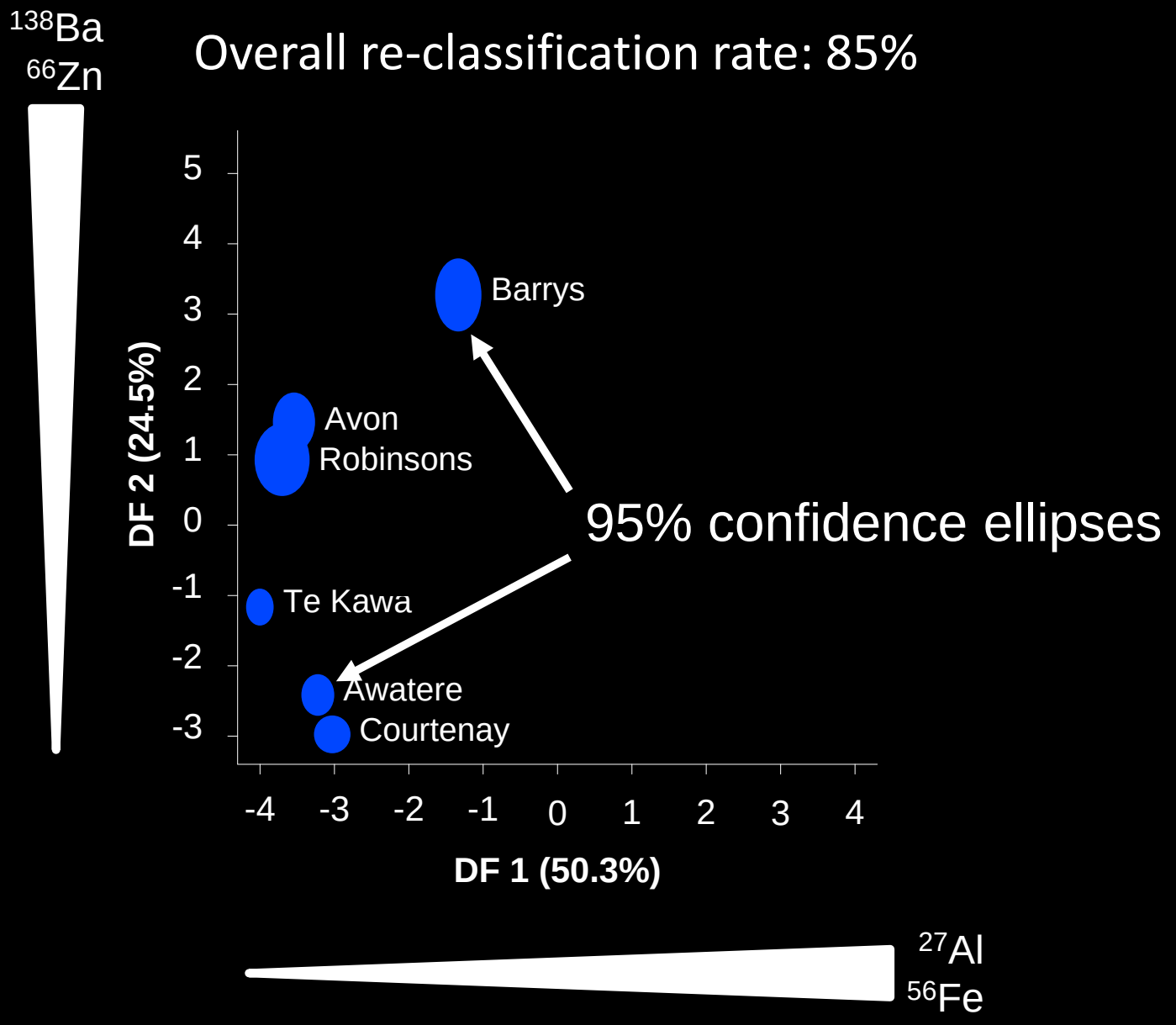
Hatchling multivariate signatures



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6 months later…

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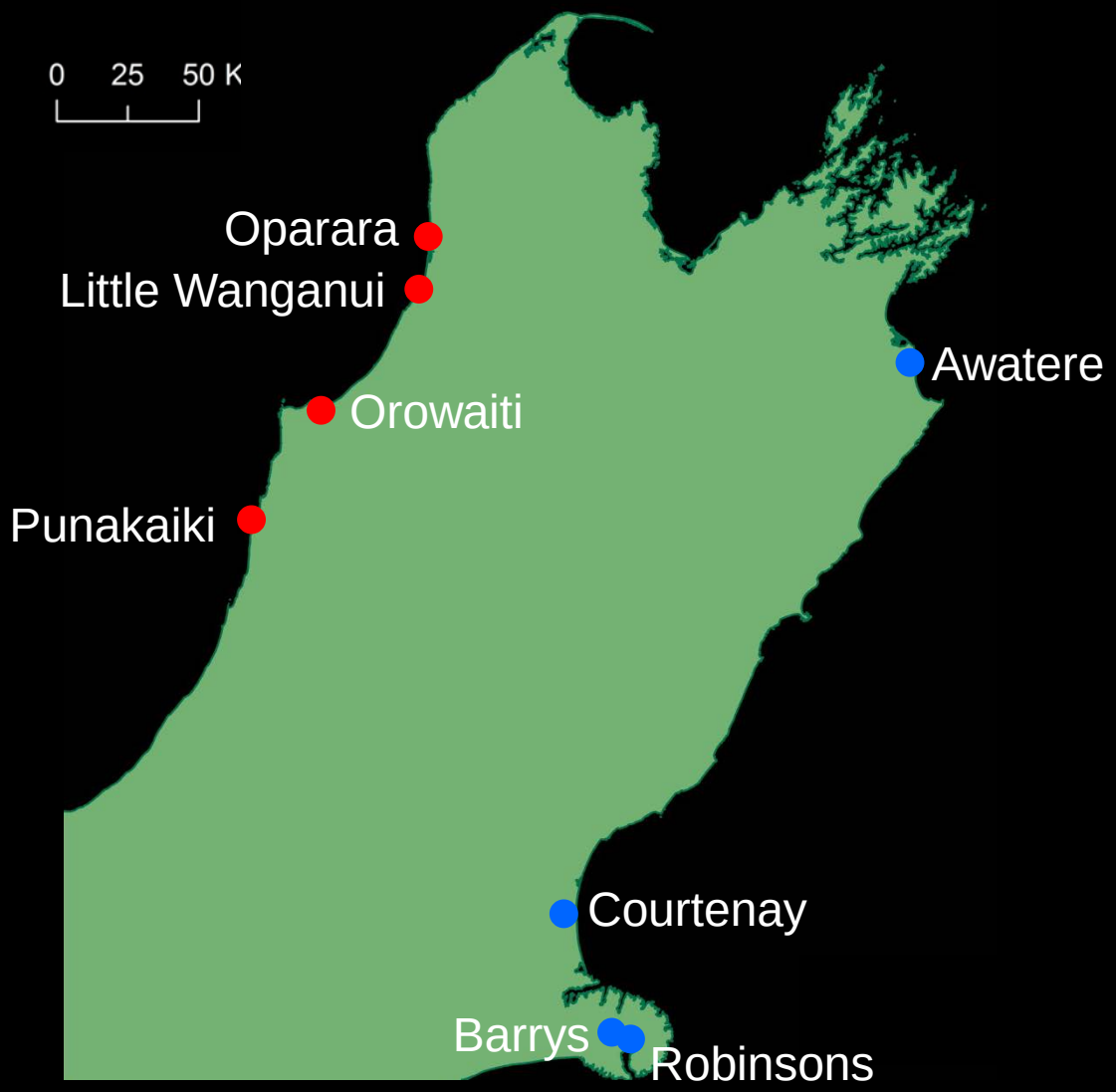
Whitebait collections (November 2009)



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Elemental signatures at whitebait otolith core

- Discriminant model from hatchling otoliths can be used to classify elemental signature at the core of whitebait otoliths → predict a likely natal origin

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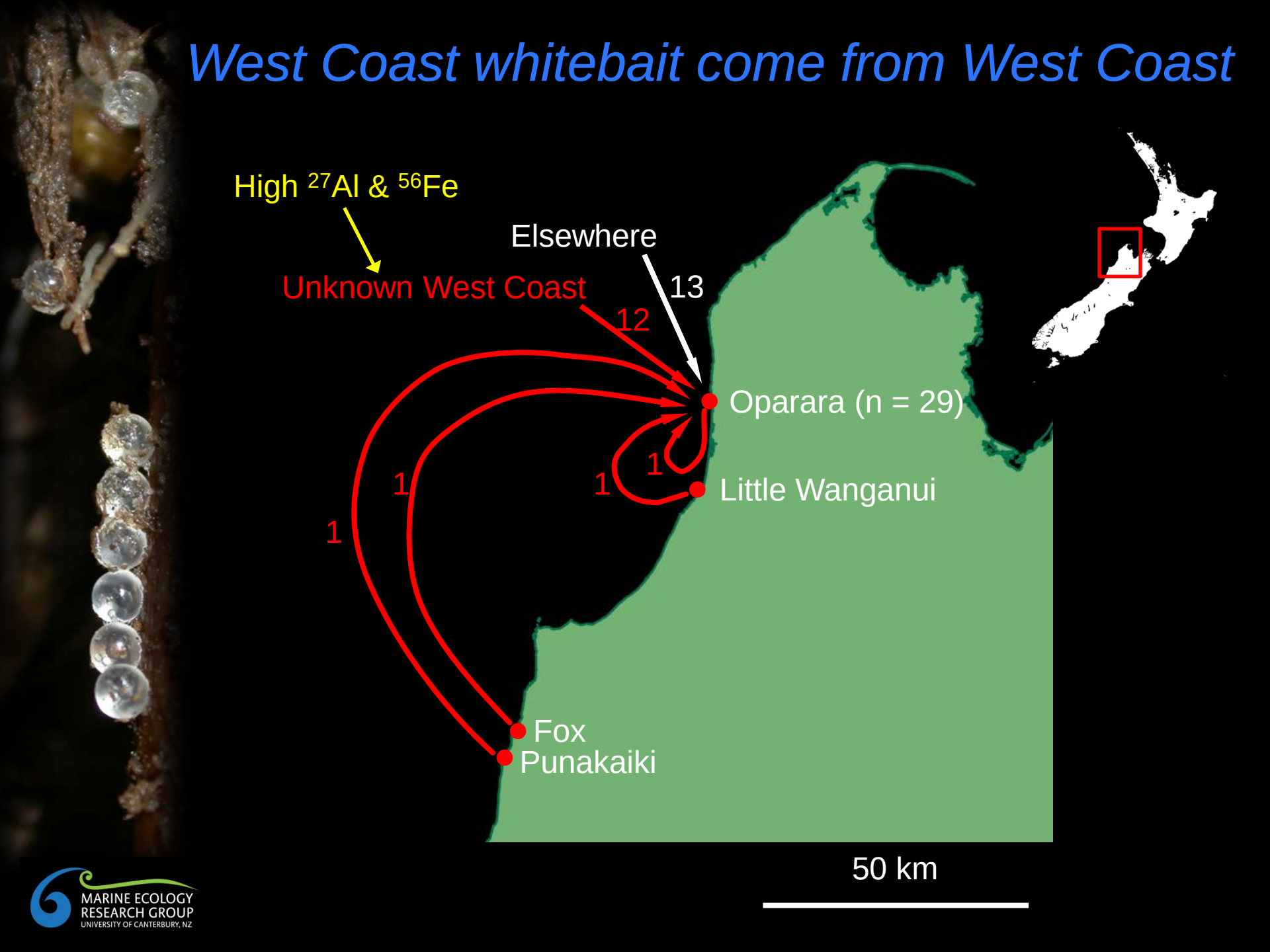
West Coast whitebait come from West Coast



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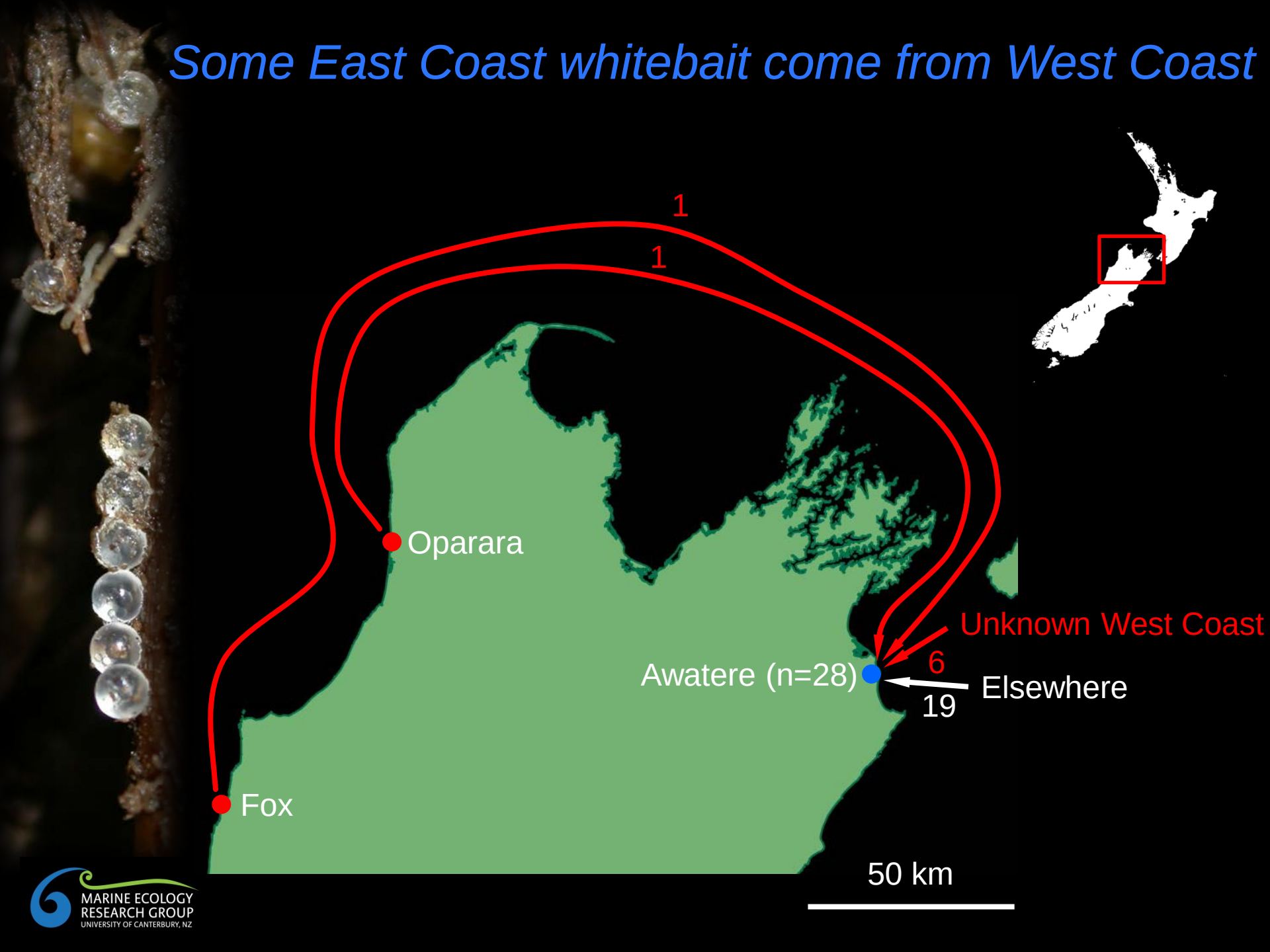
Some East Coast whitebait come from West Coast



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Some whitebait are retained locally

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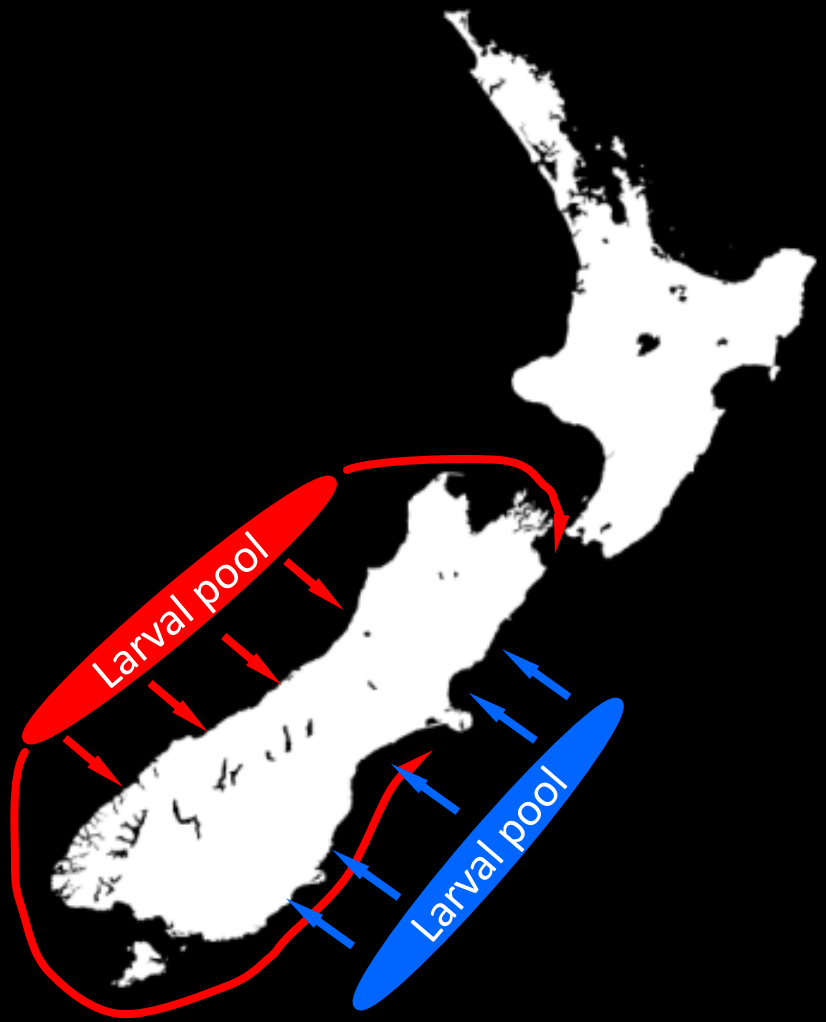
Leaky larval pools



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Summary

- Inanga show little evidence of natal homing
- Unproductive rivers with degraded spawning habitat still attract whitebait
- No ecological feedback
- Some west coast larvae enter east coast rivers as whitebait
- Modifications to east coast river mouths/spawning habitat may have increased their dependence on the subsidy of whitebait from the west coast

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